In a first aspect, the invention provides a method of purifying wastewater that includes the steps of:

(i) passing the wastewater through an electrocoagulation cell which comprises a plurality of reaction plates or electrodes disposed within said cell and spaced apart from each other, whereby said wastewater is treated by passing an electric current through the wastewater producing an electrochemical reaction which generates a floc in the electrocoagulation cell, whereby the floc binds or absorbs impurities present in the wastewater;

(ii) passing the wastewater containing said floc having bound thereto said impurities into a coagulation tank or settling tank whereby said floc is discharged from the tank to produce purified water without addition of flocculant or coagulant to the wastewater or use of an additional separating device such as a magnetic separator;

(iii) re-using said purified water for cleaning or other purposes to produce wastewater; and

(iv) recycling the wastewater back to the electrocoagulation cell.

Prior to step (i) the wastewater may be obtained from public or household showers, sinks, basins, baths, washing machines, dishwashers, kitchens or car washes and may be initially stored in a collection tank or sump.

In one embodiment, the invention provides a method of purifying wastewater from a vehicle wash facility including the steps of:

(i) collecting wastewater from a first vehicle being cleaned in said facility in a tank or sump;

(ii) transferring said wastewater from the tank or sump to an electrocoagulation cell;

(iii) passing the wastewater through an electrocoagulation cell which comprises a plurality of reaction plates or electrodes disposed within said cell and spaced apart from each other, whereby said wastewater is treated by passing an electric current through the wastewater producing an electrochemical reaction which

generates a floc in the electrocoagulation cell, whereby the floc binds or absorbs impurities present in the wastewater;

(iv) passing the wastewater containing said floc having bound thereto said impurities into a coagulation tank or settling tank whereby said floc is discharged from the tank to produce purified water without addition of flocculant or coagulant to the wastewater;

(v) re-using said purified water for cleaning a second vehicle in said facility to produce wastewater; and

(vi) recycling the wastewater back to the electrocoagulation cell.

Froth and oil from the wastewater is discharged from the settling tank or coagulation tank adjacent the top thereof by gravity.

Prior to passing the wastewater through the electrocoagulation cell the wastewater may be filtered prior to electrocoagulation treatment to remove large particles from the wastewater. Preferably, particles with a size greater than 200 μm are removed. The wastewater may also be passed through one or a plurality of pre-treatment tanks which allow the removal of heavy oils, sludge and fuel, if present, in the wastewater.

Preferably, direct current (DC) is applied to the reaction plates or electrodes of the electrocoagulation cell. This has the advantage of using a smaller number of electrodes than is the case of alternating current.

The electrocoagulation cell is preferably orientated vertically so that the outlet conduit is located at the top of the reaction chamber and the inlet conduit is located at the bottom of the reaction chamber. However, this does not preclude the use of an electrolytic cell arranged horizontally, such as described in, for example, WO 96/28389 or in US Patent No. 5,611,907. It is also possible for the water to be circulated throughout the cell in a serpentine fashion in either a vertical or horizontal

orientation.

The electrocoagulation cell may comprise any number of electrodes or reaction plates but at least two are used which are electrically coupled to the power supply.

Preferably, the voltage applied to the electrodes falls within the range 10-110 volts. More preferably, the voltage falls within the range 20-80 volts and even more preferably, 20-60 volts.

Preferably, the current applied to the electrodes falls within the range 2-100 amps. More preferably, the current falls within the range 5-60 amps and even more preferably, 5-20 amps.

The electrodes can be manufactured from any metal, for example, aluminium, steel, titanium, steel, brass and iron. Preferably, aluminium or titanium electrodes are used. Also 2-75 electrodes in the electrocoagulation cell can be used. Of these electrodes, 2-26 may be connected to the power supply. Preferably, 2-8 electrodes are connected.

Preferably, a flow rate of 2-1000 L/min is used. More preferably, a flow rate of 5-200 L/min and even more preferably 10-50 L/min is used.

The purified water is discharged into one or a plurality of settling tanks for

separation of the contaminated floc from the purified water. The settling tanks can be connected to a rainwater collection tank to allow collected rainwater to be discharged into the settling tanks to increase the volume of water available for recycling.

Preferably, the purified water is passed through a filter to remove particles before re-use. Preferably, the filter removes particles with a size greater than 10 μm.

Suitably, the purified water may be filtered and passed through a reverse osmosis system prior to re-use, to further purify the water.

The purified water can be stored in a storage tank before re-use. After re-use the water may be collected and stored in a collection tank or sump.

In a second aspect, the invention provides a closed circuit system for purifying wastewater from a vehicle wash facility comprising:

(i) a wastewater collection zone for collection or drainage of wastewater obtained from cleaning vehicles;

(ii) an electrocoagulation cell comprising a plurality of reaction plates or electrodes spaced apart from each other for processing wastewater so as to produce a floc in the electrocoagulation cell whereby the floc binds or absorbs impurities present in the wastewater;

(iii) a coagulation or settling tank for separating the floc from the purified water; and

(iv) an application zone for application or use of the purified water for cleaning vehicles.

The system may include one or more of the following apparatus:

(a) one or a plurality of pre-treatment tanks;

(b) one or a plurality of settling or coagulation tanks;

(c) a collection tank for the collection of rainwater;

(d) one or a plurality of filters

(e) a reverse osmosis system;

(f) a water softening system; and

(g) a de-chlorination system.

The application zone may include a storage tank or sump.

The system may include a collection conduit for recycling wastewater back to the electrocoagulation cell and a storage tank or sump upstream of the wastewater collection zone.

a movable valve member such as a ball. Alternatively a swing and lift valve may be used.

Preferably, if an electrocoagulation cell comprises 8-75 electrodes with a gap of 3 mm between each electrode and 2-26 electrode connections to a DC power source, the voltage applied to the electrocoagulation cell falls within the range 10-110 volts (DC) and the current may fall within the range of 2-100 amps. These values will of course be dependent upon the varying characteristics of the sample matrix of the wastewater.

The wastewater may remain in settling tanks 9, 13 and 16 for a variable amount of time. Preferably, the wastewater remains in each tank for 20-60 minutes, more preferably, 30-40 minutes.

Preferably, no chemicals are used in the process. However, in some circumstances it may be necessary to add chemicals for (i) conductivity modification or standardisation and; (ii) for pH control (in cases of high or low pH wastewater);

Modifications may be made to the purification process. Any of the pre-treatment or post-treatment steps may be omitted subject to the nature or composition of the wastewater.

(i) Use of the pre-treatment (or a triple interceptor) tanks may be required, for example, in manual car washes and vehicle service facilities wherein the wastewater may comprise fuel, sludge and heavy oils. This may occur if car maintenance, such as oil changing and radiator fluid changing, is carried out in the area. Purification of